

Gas Kinematics of Lyman α Emitters at $z \sim 2.2$

SHIBUYA, Takatoshi
(ICRR)

OUCHI, Masami
(ICRR/University of Tokyo)

NAKAJIMA, Kimihiko*
(California Institute of Technology)

HASHIMOTO, Takuya
(Lyon Observatory)

ONO, Yoshiaki
(ICRR/University of Tokyo)

RAUCH, Michael
(Observatories of the Carnegie Institution of Washington)

GAUTHIER, Jean-Rean
(California Institute of Technology)

SHIMASAKU, Kazuhiro, GOTO, Ryosuke
(University of Tokyo)

MORI, Masao, UMEMURA, Masayuki
(University of Tsukuba)

Ly α Emitters (LAEs) are an important population of high- z star-forming galaxies in the context of galaxy formation. Additionally, LAEs are used to measure the neutral hydrogen fraction at the reionizing epoch, because Ly α photons are absorbed by intergalactic medium. However, Ly α emitting mechanism is not fully understood due to the highly-complex radiative transfer of Ly α in the interstellar medium.

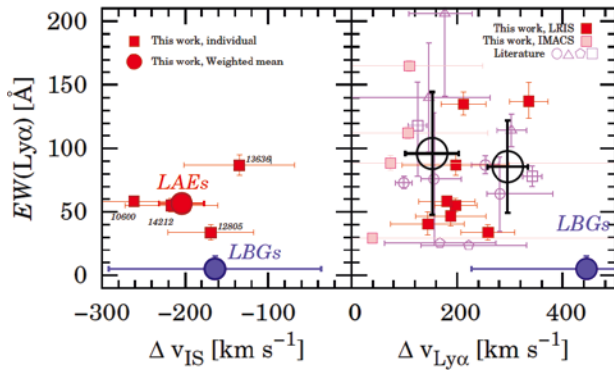


Figure 1: Rest-frame Ly α EW as a function of $\Delta v_{Ly\alpha}$ and Δv_{IS} . Red symbols represent our $z \sim 2.2$ LAEs [2].

Ly α emissivity may not only depend on the spatial ISM distribution, but on the gas kinematics as well. The gas kinematics of LAEs has been evaluated from the Ly α velocity offset ($\Delta v_{Ly\alpha}$) with respect to the systemic redshift (z_{sys}) traced by nebular emission lines (e.g. [O III]). Hashimoto et al. (2013) find an anti-correlation between Ly α equivalent width (EW) and $\Delta v_{Ly\alpha}$ [1]. However, $\Delta v_{Ly\alpha}$ is thought to increase with both resonant scattering in H I gas clouds as well as galactic outflow velocity. The gas kinematics can be investigated more directly from the velocity offset between interstellar (IS) absorption lines of the rest-frame UV continua and z_{sys} (IS velocity offset; Δv_{IS}).

We present a statistical study of $\Delta v_{Ly\alpha}$ and Δv_{IS} for LAEs at $z \simeq 2$. We make a sample of 22 LAEs based on our deep Keck/LRIS observations, in conjunction with spectroscopic data from the Subaru/FMOS program and the literature [2,3]. We confirm the anti-correlation between Ly α EW and $\Delta v_{Ly\alpha}$ (Fig. 1). Our LRIS data

successfully identify blue-shifted multiple IS absorption lines in the UV continua of four LAEs on an individual basis (Fig. 2). The average Δv_{IS} is $-200 \sim -300 \text{ km s}^{-1}$, indicating LAE's gas outflow with a velocity comparable to typical LBGs. The results of our study suggest that LAEs have a small N_{HI} compared to LBGs.

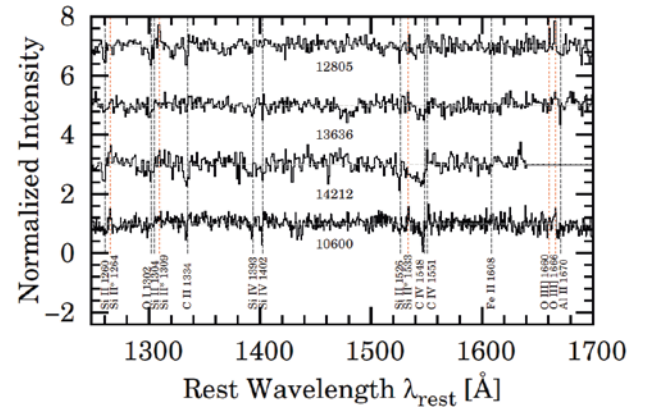


Figure 2: Normalized UV spectra of the four continuum detected LAEs [2].

References

- [1] Hashimoto, T., et al.: 2013, *ApJ*, **765**, 70.
- [2] Shibuya, T., et al.: 2014, *ApJ*, **788**, 74.
- [3] Nakajima, K., et al.: 2012, *ApJ*, **745**, 12.

* NAOJ at the time of publication.